



PTO/SB/21 (08-00)

Approved for use through 10/31/2002. OMB 0651-0031

U.S. Patent and Trademark Office: U.S. DEPARTMENT OF COMMERCE

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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/604,837
Filing Date	08/21/2003
First Named Inventor	Chia-Chen Liao
Group Art Unit	
Examiner Name	
Attorney Docket Number	YOIP0002USA

Total Number of Pages in This Submission **3**

ENCLOSURES (check all that apply)

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| <input checked="" type="checkbox"/> Fee Transmittal Form
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<input type="checkbox"/> Amendment / Reply
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Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm
or
Individual name

Winston Hsu, Reg. No.: 41,526

Signature

Date

8/29/2003

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PTO/SB/02B (11-00)
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DECLARATION — Supplemental Priority Data Sheet

Additional foreign applications:

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY)	Priority Not Claimed	Certified Copy Attached?	
				YES	NO
091213464	Taiwan, R.O.C.	08/23/2002	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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FEE TRANSMITTAL for FY 2003

Effective 01/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT (\$) 0.00

Complete if Known

Application Number	10/604,837
Filing Date	8/21/2003
First Named Inventor	Chia-Chen Liao
Examiner Name	
Art Unit	
Attorney Docket No.	YOIP0002USA

METHOD OF PAYMENT (check all that apply)

☐ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 50-0801
Deposit Account Name: North America International Patent Office

The Commissioner is authorized to: (check all that apply)

☒ Charge fee(s) indicated below ☒ Credit any overpayments
☒ Charge any additional fee(s) during the pendency of this application
☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1001 750	2001 375	Utility filing fee	
1002 330	2002 165	Design filing fee	
1003 520	2003 260	Plant filing fee	
1004 750	2004 375	Reissue filing fee	
1005 160	2005 80	Provisional filing fee	

SUBTOTAL (1) (\$) 0.00

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

	Extra Claims	Fee from below	Fee Paid
Total Claims	-20** =	X	
Independent Claims	-3** =	X	
Multiple Dependent			

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description
1202 18	2202 9	Claims in excess of 20
1201 84	2201 42	Independent claims in excess of 3
1203 280	2203 140	Multiple dependent claim, if not paid
1204 84	2204 42	** Reissue independent claims over original patent
1205 18	2205 9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$) 0.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code (\$)	Small Entity Fee Code (\$)	Fee Description	Fee Paid
1051 130	2051 65	Surcharge - late filing fee or oath	
1052 50	2052 25	Surcharge - late provisional filing fee or cover sheet	
1053 130	1053 130	Non-English specification	
1812 2,520	1812 2,520	For filing a request for <i>ex parte</i> reexamination	
1804 920*	1804 920*	Requesting publication of SIR prior to Examiner action	
1805 1,840*	1805 1,840*	Requesting publication of SIR after Examiner action	
1251 110	2251 55	Extension for reply within first month	
1252 410	2252 205	Extension for reply within second month	
1253 930	2253 465	Extension for reply within third month	
1254 1,450	2254 725	Extension for reply within fourth month	
1255 1,970	2255 985	Extension for reply within fifth month	
1401 320	2401 160	Notice of Appeal	
1402 320	2402 160	Filing a brief in support of an appeal	
1403 280	2403 140	Request for oral hearing	
1451 1,510	1451 1,510	Petition to institute a public use proceeding	
1452 110	2452 55	Petition to revive - unavoidable	
1453 1,300	2453 650	Petition to revive - unintentional	
1501 1,300	2501 650	Utility issue fee (or reissue)	
1502 470	2502 235	Design issue fee	
1503 630	2503 315	Plant issue fee	
1460 130	1460 130	Petitions to the Commissioner	
1807 50	1807 50	Processing fee under 37 CFR 1.17(q)	
1806 180	1806 180	Submission of Information Disclosure Stmt	
8021 40	8021 40	Recording each patent assignment per property (times number of properties)	
1809 750	2809 375	Filing a submission after final rejection (37 CFR 1.129(a))	
1810 750	2810 375	For each additional invention to be examined (37 CFR 1.129(b))	
1801 750	2801 375	Request for Continued Examination (RCE)	
1802 900	1802 900	Request for expedited examination of a design application	

Other fee (specify)

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$) 0.00

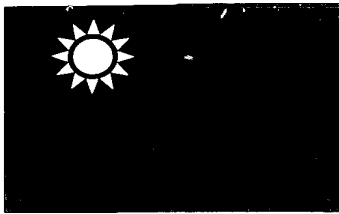
SUBMITTED BY

Name (Print/Type)	Winston Hsu	Registration No. (Attorney/Agent)	41,526	Telephone	886289237350
Signature	<i>Winston Hsu</i>			Date	8/29/2003

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中華民國經濟部智慧財產局

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REPUBLIC OF CHINA

茲證明所附文件，係本局存檔中原申請案的副本，正確無訛，
其申請資料如下：

This is to certify that annexed is a true copy from the records of this
office of the application as originally filed which is identified hereunder:

申 請 日：西元 2002 年 08 月 23 日
Application Date

申 請 案 號：091213464
Application No.

申 請 人：揚明光學股份有限公司
Applicant(s)

局 長
Director General

蔡 練 生

發文日期：西元 2003 年 6 月 26 日
Issue Date

發文字號：09220632510
Serial No.

申請日期：	案號：
類別：	

(以上各欄由本局填註)

新型專利說明書

一、 新型名稱	中 文	投影顯示光學系統
	英 文	OPTICAL SYSTEM FOR PROJECTION DISPLAY
二、 創作人	姓 名 (中文)	1. 廖洽成 2. 康尹豪 3. 鄭竹明 4. 莊庚翰
	姓 名 (英文)	1. Chia-Chen Liao 2. Yi - Hao Kang 3. Chu-Ming Cheng 4. Keng-Han Chuang
	國 籍	1. 中華民國 2. 中華民國 3. 中華民國 4. 中華民國
	住、居所	1. 新竹科學工業園區新竹市力行路11號 2. 新竹科學工業園區新竹市力行路11號 3. 新竹科學工業園區新竹市力行路11號 4. 新竹科學工業園區新竹市力行路11號
三、 申請人	姓 名 (名稱) (中文)	1. 揚明光學股份有限公司
	姓 名 (名稱) (英文)	1. Young Optics Inc.
	國 籍	1. 中華民國
	住、居所 (事務所)	1. 新竹科學工業園區新竹市力行路11號
	代表人 姓 名 (中文)	1. 張威儀
	代表人 姓 名 (英文)	1. Wade Chang



四、中文創作摘要 (創作之名稱：投影顯示光學系統)

本創作為一種投影顯示光學系統，主要係在光閥與投影鏡頭間設一全反射透鏡，當光源產生之白色照明光束通過色輪後即轉換成紅、綠、藍色光束，且藉由光學積分器達到均勻化後，接著照射在一全反射透鏡，用以將來自光源的光全反射至光閥，透過光閥的反射再將光投射至投影鏡頭而投射在螢幕上以提高投影效率，並縮簡投影顯示光學系統之體積及元件。

英文創作摘要 (創作之名稱：OPTICAL SYSTEM FOR PROJECTION DISPLAY)

An optical system for projection display inserts primarily a total reflection lens between a light valve and a projection lens. When a white light beam, emitting from a light source, passes through a color wheel, the color of the light beam is converted sequentially into red, green, and blue colors, and is uniformed by an integrator. Then, the light beam impinges into the total reflection lens and is reflected to the light valve. By means of the light valve, the light beam is reflected

四、中文創作摘要 (創作之名稱：投影顯示光學系統)

英文創作摘要 (創作之名稱：OPTICAL SYSTEM FOR PROJECTION DISPLAY)

into the projection lens to project on a screen. Therefore, this invention increases the efficiency of the projector and curtails the volume and components of the optical system of projection display.



本案已向

國(地區)申請專利

申請日期

案號

主張優先權

無

五、創作說明 (1)

創作領域

本創作係關於一種光學系統，尤其關於投影顯示裝置中使用之光學系統。

相關技術說明

光電技術演進的趨勢在於將資訊視覺化，而決定投影品質的關鍵往往在於投影顯示裝置之光學系統部份，在成本的考量下，如何製造易於攜帶且具高清晰度的投影顯示裝置，以提昇市場競爭力一直是業界致力研發的重心所在。

請參閱圖1，為習知投影顯示裝置之光學系統10，係由光源11提供一白色照明光束，光束經由光源反射罩(reflector)12，聚集反射至一色彩產生器13[例如：色輪(color wheel)等]，色彩產生器13包含一系列紅色、綠色及藍色等濾鏡，當光束通過色彩產生器13時，即轉換成一紅、綠、藍色之有色光束，利用色彩產生器13後設的第一聚光鏡(condenser lens) 141、第二聚光鏡142將有色光束收集並傳遞，接著藉由第一平面鏡151，將光束反射轉向上至第三聚光鏡143，再藉由第二平面鏡152反射穿過第四聚光鏡144，照射至數位微鏡片光學元件(Digital Micro-mirror Device, DMD)16，運用數位微鏡片光學元件16上可樞轉 ± 12 度之微鏡片陣列，當微鏡片陣列切換至開狀(ON-state)時，光束即入射進入投影鏡頭17，而投影至螢幕(未圖示)上，當微鏡片陣列切換至關狀(OFF-



五、創作說明 (2)

tate) 時，光束即偏離投影鏡頭17，不會投影至螢幕上，以適當選擇所需投影光束。

如圖2所示，習知投影顯示裝置之光學系統10為使整個光學系統體積更小，一般係將第三聚光鏡143儘量往數位微鏡片光學元件16與投影鏡頭17間光軸靠近，因此有色光束經第三聚光鏡143入射至第二平面鏡152時，部份光束極易被投影鏡頭17擋到，造成所謂的機構與光學間的干涉，會影響投影裝置之照明效率。習知投影顯示裝置為避免此機構干涉，係將投影鏡頭17往螢幕18方向移至投影鏡頭17'，或將第三聚光鏡143往外移至第三聚光鏡143'位置，但此均會形成光學系統之光路徑加長，造成投影顯示裝置之光學系統體積龐大。

另外習知技術必須通過三個聚光透鏡141、142、143及二個反射鏡151、152後才入射至數位微鏡片光學元件16，使用元件過多，不僅造成光路結構複雜，同時亦增加製造成本，也衍生光學路徑加長與整體光學系統體積龐大等問題。因此，習知投影顯示裝置具有相當多之缺點，有待改善。

創作目的及概述

本創作之一目的在提供一種投影顯示光學系統，藉一全反射透鏡以避免機構干涉，提高投影效率與投影畫面品質。

本創作之另一目的在提供一種投影顯示光學系統，可



五、創作說明 (3)

減少光學構件簡化光學系統，以使整體投影顯示裝置體積更為縮簡。

為達成上述之目的，本創作投影顯示光學系統，主要係在光閥與投影鏡頭間設一全反射透鏡，當光源產生之白色照明光束通過色輪後即轉換成紅、綠、藍色光束，且藉由光學積分器達到均勻化後，接著照射在一全反射透鏡，用以將來自光源的光全反射至光閥，透過光閥的反射再將光投射至投影鏡頭而投射在螢幕上。

圖式簡單說明

圖1 顯示習知投影顯示裝置之光學系統示意圖。

圖2 顯示習知投影顯示裝置之光學系統產生機構干涉與消除機構干涉示意圖。

圖3 顯示本創作一較佳實施例之光學系統示意圖。

圖4 顯示依本創作一較佳實施例光學系統之消除機構干涉示意圖。

主要圖號說明

- | | | | |
|--------------|-------|----|-------|
| 20 | 光學系統 | 21 | 光源 |
| 22 | 光源反射罩 | 23 | 色彩產生器 |
| 24、24' 光學積分器 | | | |
| 25 全反射透鏡 | | | |
| 251 透鏡表面 | | | |
| 252 全反射面 | | | |



五、創作說明 (4)

26 光閥

27 投影鏡頭組

28 螢幕

29、29' 入射光束

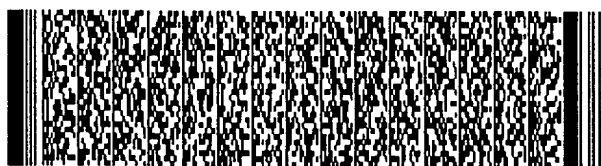
詳細說明

有關本創作為達成上述目的，所採用之技術手段及其餘功效，茲舉一較佳實施例，並配合圖式加以說明。

請參閱圖3，本創作投影顯示光學系統20，主要包括照明系統、全反射透鏡25及成像系統等部份。其中照明系統包含有光源21、光源反射罩22、色彩產生器23、光學積分器24等元件，(成像系統則包含光閥26與投影鏡頭組27)。

本創作之光學系統20係由光源21提供一白色照明光束，光束經由光源反射罩22，聚集反射至一色彩產生器23 [例如：色輪等]，該色彩產生器23包含一系列紅色、綠色及藍色等濾鏡，當光束通過色彩產生器23時，即轉換成一紅、綠、藍色之有色光束，再通過一光學積分器24(例如：柱狀積分器(Rod integrator)，將有色光束均勻化後，投射至一全反射透鏡25，藉該全反射透鏡25將光束反射進入光閥26(例如：數位微光學元件(DMD))，當光閥26在開-狀(ON state)時，光束會自光閥26反射後進入投影鏡頭組27，投影在螢幕28上；反之，當光閥26在關-狀(OFF state)時，光束會自光閥26反射後即偏離投影鏡頭27，而不會投影在螢幕28上。

本創作投影顯示光學系統20，藉由沿著光源21行進之



五、創作說明 (5)

光路徑，在光學積分器24後固設一全反射透鏡25用以接收來自照明系統之光束，將光束反射進入成像系統之光閥26與投影鏡頭組27，投影至投影螢幕28上，以構成投影顯示光學系統20，因而，可減少使用多個聚光透鏡及反射鏡，不僅降低製造成本，且使光學系統之體積縮小。

請參閱圖4，本創作之全反射透鏡25，具有一透鏡表面251與一全反射面252，全反射面252可為鍍層或反射鏡面等，當實線表示之光束29進入透鏡表面251時，入射光束依折射定律往透鏡內移，當光束29繼續入射至全反射面252時，所有入射光束29均會反射再次而穿出透鏡表面251，光束29會再依折射定律往光閥26方向偏移，而入射至光閥26，然而相對於習知光學系統，對於相同入射至光閥26之光束，就需以較大角度入射，如虛線之光束29'所示，而所使用光學積分器24'之口徑相對也會增大，同時容易形成機構干涉，因此藉由本創作全反射透鏡25可達到將光束聚集之功效，在設計上即可使用較小尺寸的光學積分器24，而不必使用較大光學積分器24'，如此一來，可達到消除習知技術因使用大尺寸之光學積分器24'所造成機構干涉的問題，亦可使整個光學系統20之體積縮小，進而簡化整個投影顯示裝置之體積。同時全反射面252更可較習知技術提高2%~5%之反射效率。此外，本創作之全反射透鏡25亦可為一曲面鏡。

以上所述者，僅為用以方便說明本創作之較佳實施例，本創作之範圍不限於較佳實施例，凡依本創作所作的任



五、創作說明 (6)

何變更，於不脫離本創作之精神下，皆屬本創作申請專利之範圍。此外，本創作深具「產業利用性、新穎性及進步性」等創作專利要件，故爰依法提出創作專利之申請。祈



圖式簡單說明

圖式簡單說明

圖1 顯示習知投影顯示裝置之光學系統示意圖。

圖2 顯示習知投影顯示裝置之光學系統產生機構干涉與消除機構干涉示意圖。

圖3 顯示本創作一較佳實施例之光學系統示意圖。

圖4 顯示依本創作一較佳實施例光學系統之消除機構干涉示意圖。

主要圖號說明

20	光學系統	21	光源
22	光源反射罩	23	色彩產生器
24、24'	光學積分器		
25	全反射透鏡		
251	透鏡表面		
252	全反射面		
26	光閥	27	投影鏡頭組
28	螢幕		
29、29'	入射光束		



六、申請專利範圍

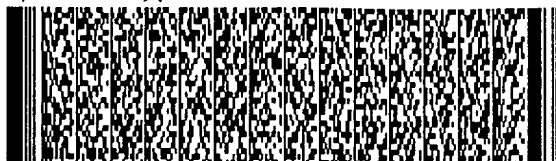
1. 一種投影顯示光學系統，包含：
一光源，產生一光束；
一成像系統，包含一光閥與一投影鏡頭；以及
一全反射透鏡，包括一全反射面；
其中該全反射透鏡接收來自該光源之光束，且藉由全反射面將光束反射至該光閥，再利用該光閥將光束反射進入該投影鏡頭。
2. 依申請專利範圍第1項之投影顯示光學系統，其中該全反射透鏡另包含一面向光源之透鏡表面。
3. 依申請專利範圍第1項之投影顯示光學系統，其中該全反射面為一全反射鍍層。
4. 依申請專利範圍第1項之投影顯示光學系統，其中該全反射面為一反射鏡面。
5. 依申請專利範圍第1項之投影顯示光學系統，其中該光源與全反射透鏡間設一光學積分器。
6. 依申請專利範圍第1項之投影顯示光學系統，其中該全反射透鏡為一曲面鏡。



第 1/12 頁



第 2/12 頁



第 2/12 頁



第 3/12 頁



第 5/12 頁



第 5/12 頁



第 6/12 頁



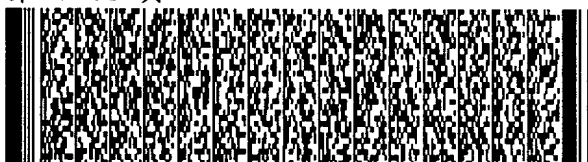
第 6/12 頁



第 7/12 頁



第 8/12 頁



第 8/12 頁



第 9/12 頁



第 9/12 頁



第 10/12 頁



第 11/12 頁



第 12/12 頁



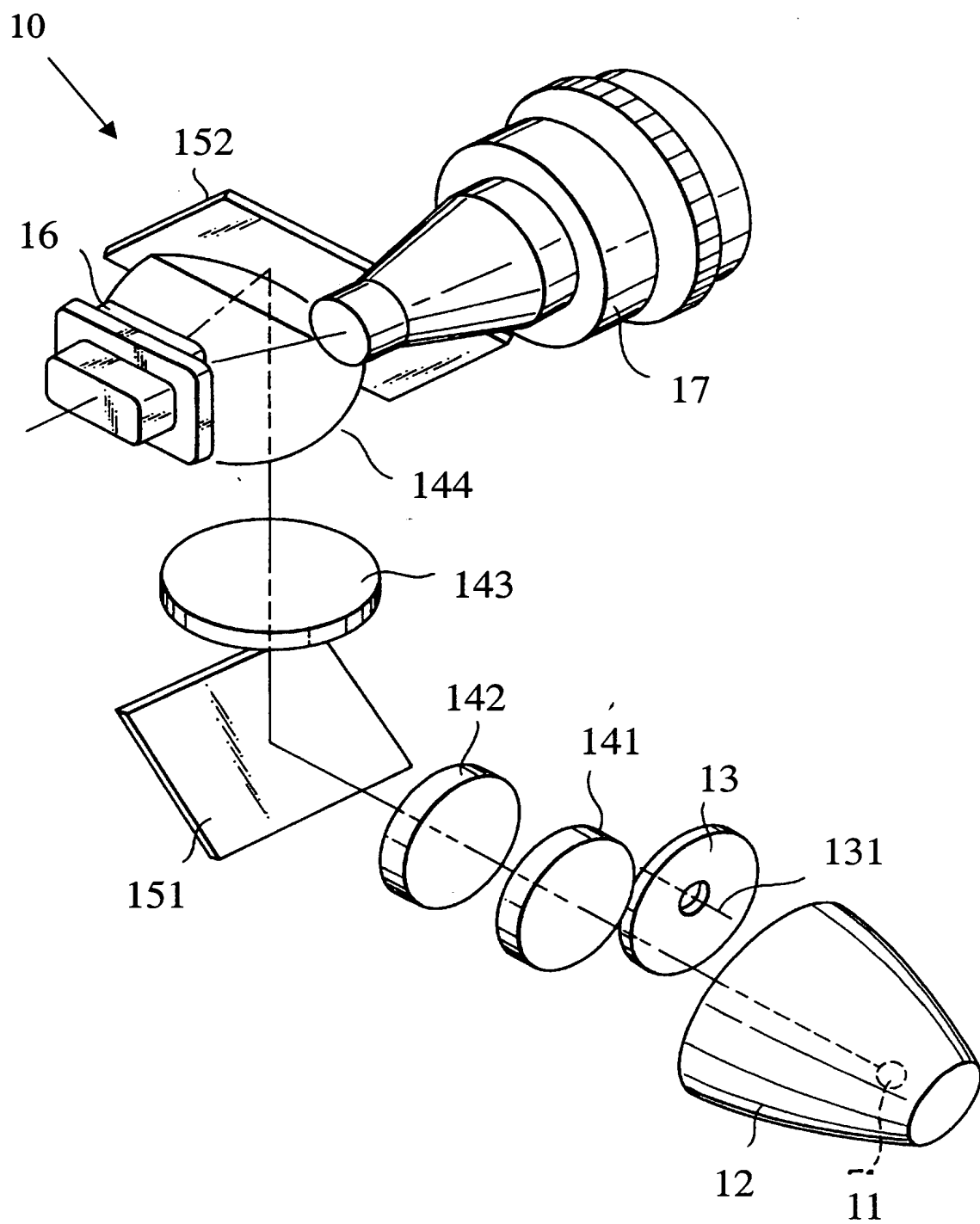


圖 1

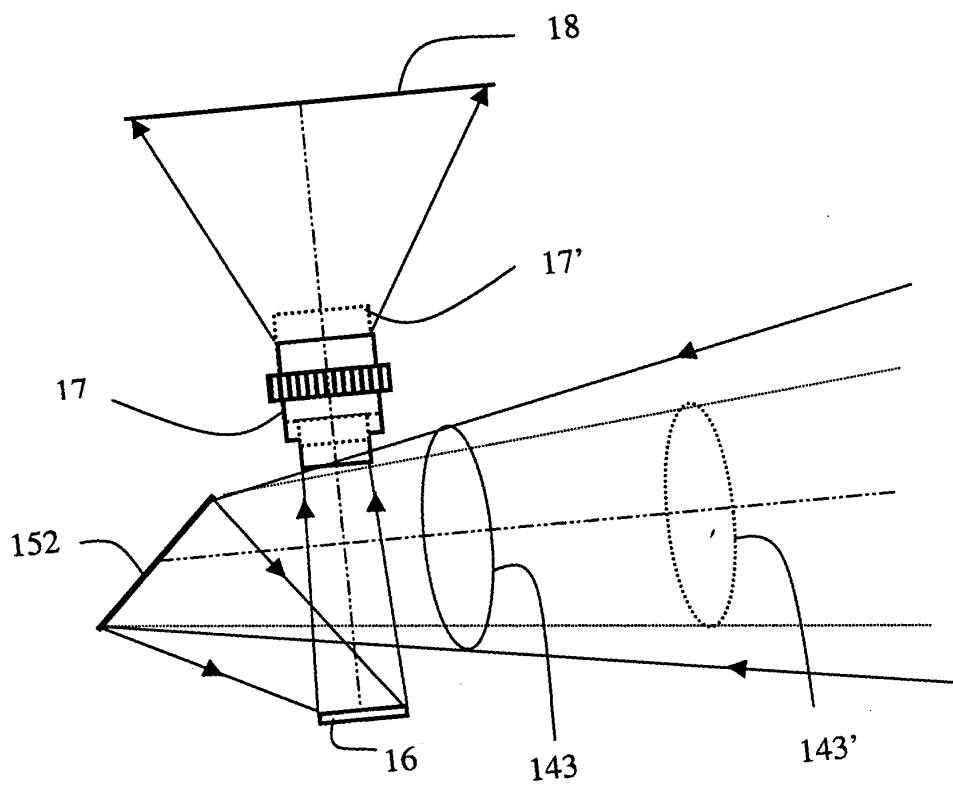


圖 2

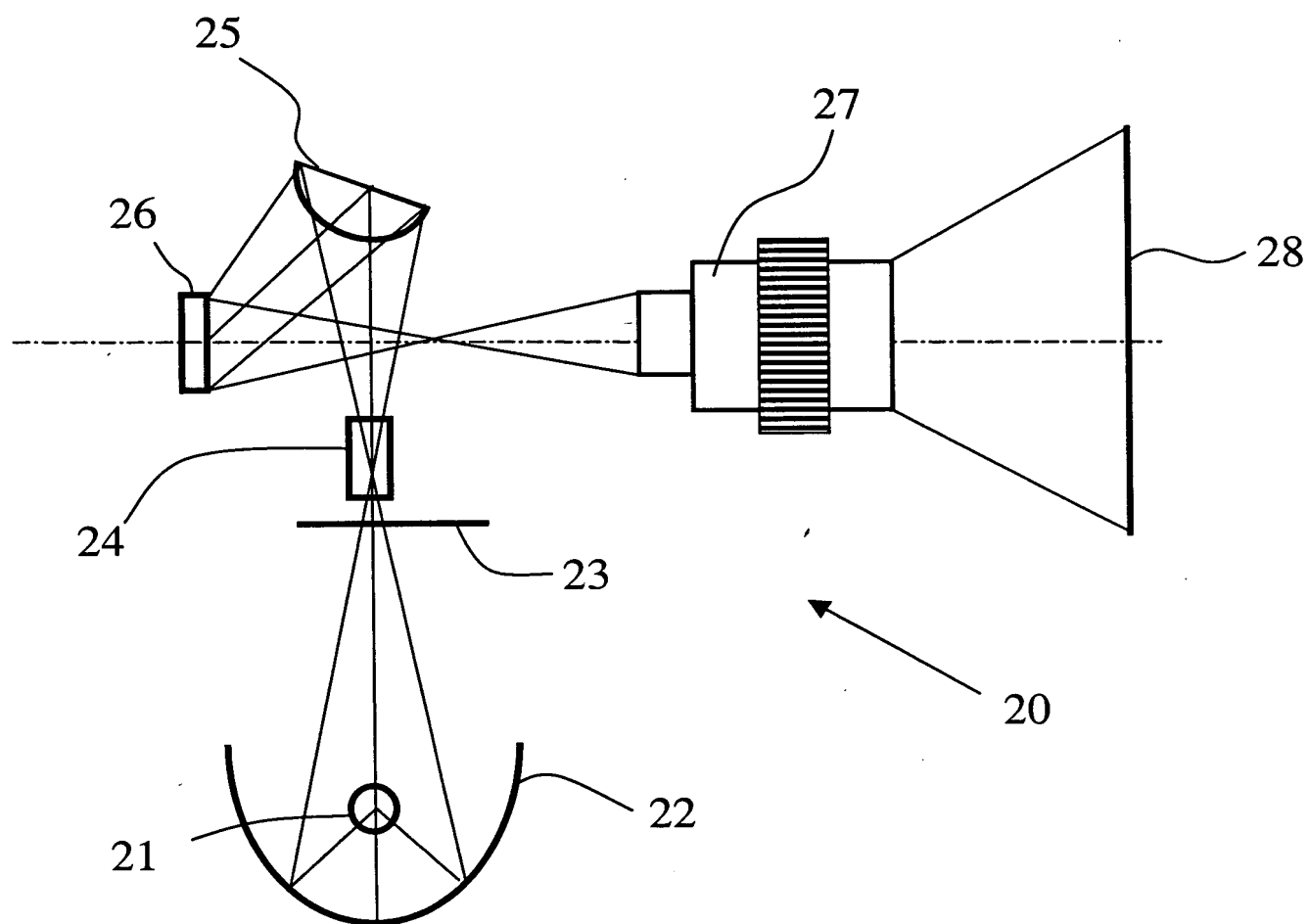


圖 3

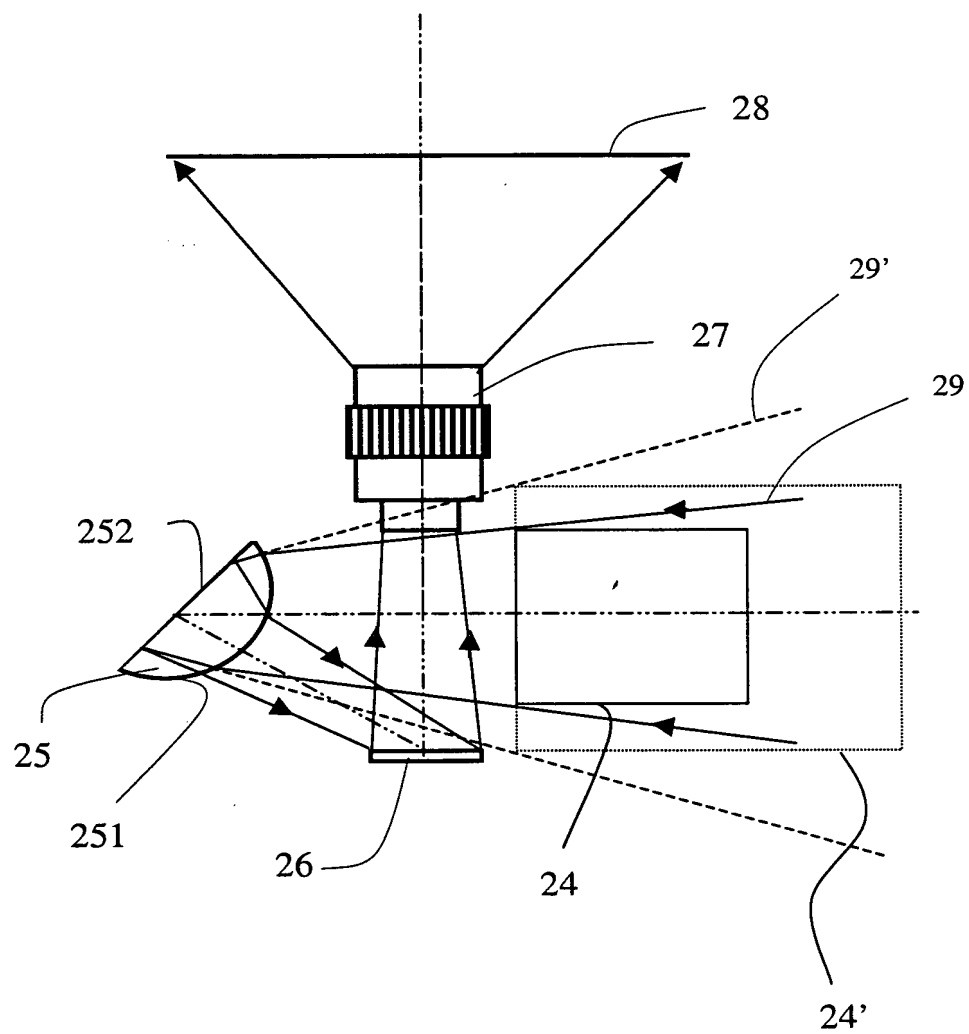


圖 4